

The War in the Persian Gulf

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Editor's Note: The following article is an edited version of the last part of Chapter 3 of The Logistics of Waging War, Volume 2, US Military Logistics, 1982-1993, The End of "Brute Force" Logistics, which was recently published by the Air Force Logistics Management Agency. The first part of Chapter 3 was published in Volume XXII, Number 2. This monograph chronicles logistics efforts and operations from 1982-1993 and examines the final chapters of what has been aptly called the era of "brute force" logistics. Volume 2 is available in hard copy through the Air Force Journal of Logistics or via the World Wide Web (<http://www.il.hq.af.mil/aflma/lgj/lww2.html>).

Theater Logistics

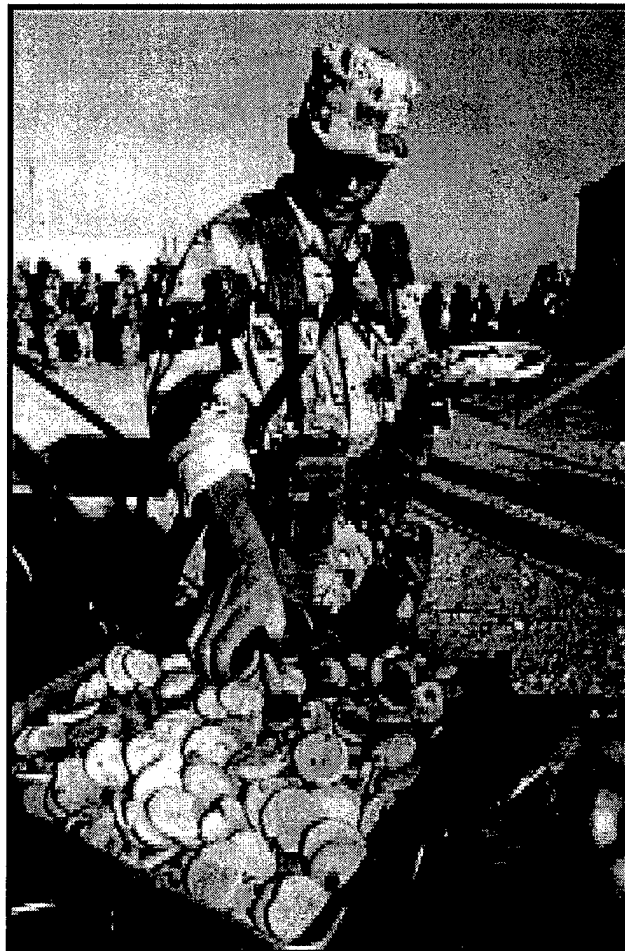
Due to the pressing urgency of the initial deployment to the Gulf, and a strong possibility that Iraqi forces might move on Saudi Arabia before a substantial US defensive presence could be established, the decision was made early on to deploy combat units significantly in advance of their supporting units. This meant that at the operation's onset US forces found themselves without their standard established logistics structure. Eventually, the size of the US logistics force in the region would grow to over 40,000 with about 60 percent coming from the Reserves or the National Guard.¹

To facilitate a secure logistics base in the Gulf Theater, support personnel built roads and laid pipeline. Supplies needed by combat troops were transported forward to strategic locations near the front lines in order to make them more accessible to the troops that needed them. US forces even went so far as to build a helicopter refueling strip inside the Iraqi border to provide for faster servicing and turn-times for combat helicopters involved in close air support of allied forces.²

A critical difference between supporting DESERT SHIELD and supporting a combat force of the same size in a European theater was the road system. The challenge in Saudi Arabia was getting the critical tonnages of food, fuel and bullets from the APODs and SPODs forward to the combat maneuver units.³

Food, Subsistence and Rations

Military commanders have often subscribed to the notion that the quality of the food available to fighting forces in the field will impact their performance in combat. For this reason, providing adequate rations for military personnel in the field is of paramount concern to the managers of the supporting logistics system. Using mobile kitchen facilities, existing dining facilities and host nation contracted support, the Department of Defense was generally able to meet this goal for the majority of deployed personnel. However, due to their locations, some Army and Marine Corps units had substantial difficulties obtaining a variety of foodstuffs and alternatives to meals-ready-to-eat (MRE) rations.



US personnel visiting the traditional military *chow line*. The variety and type of rations provided depended on where the unit was deployed and the food preparation facilities available. (Official Air Force Photo)

Food Services

Throughout the theater of operations, commanders were given significant latitude to provide the highest quality rations they could obtain given the constraints of the existing environment.

The variety and type of rations provided depended entirely on where a given unit was stationed and the type of preparation facilities available in the area. Air Force units, enjoying the relative benefits of operating from stable, fixed locations, generally enjoyed fresh food supplied by host nation contractors. Army and Marine units, by nature of their constantly changing positions and tactical environments, had to subsist mainly on MREs and occasionally tray pack T-rations. Fresh food was made available whenever the situation permitted, with deliveries of limited quantities of morale-boosting favorites such as fresh

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fruit delivered by whatever means of transportation happened to be operating in the area.

In less than a month after President Bush committed US troops to Saudi Arabia, the Defense Logistic Agency had shipped 15.6 million MREs and 2.6 million tray-pack rations to the theater. They also sent 10 million loaves of bread, 6.3 million pounds of meat, 4.9 million pounds of fish and 2.8 million pounds of fresh fruit and vegetables.⁴

All the Services did their best to provide fresh or frozen foodstuffs and other supplements such as fruit, juices, soft drinks and the like from facilities located throughout the region. Each Service developed a daily feeding plan, outlining the types and quantities of meals supplied to its troops in the field. The Army feeding plan called for one MRE and two hot meals to be provided to each soldier daily. Illustrating the difficulties encountered in theater, the Army was never able to meet this plan due to the inability of producers in the United States to meet the actual demand for T-rations that materialized during the Gulf War. As a result, the Army relied on MREs and B-rations, which, in-turn, prompted a shortage of the components for B-rations, in particular meats and vegetables. Here again, the cause was the inability of the domestic producers to meet the unanticipated demand for these components by deployed US forces.

In response to these shortages, the Army developed and adopted meals, off-the-shelf, ready-to-eat (MOREs)—a product generally well accepted by the troops and often a welcome change from the stock MREs the majority of forward employed ground troops had grown accustomed to.

Recognizing the importance of food to maintaining troop morale and the potential ill effects of the limited availability of diverse rations, the *Wolfburger* stand was developed. The brain child of a warrant officer aide to Army Major General Pagonis, the *Wolfburger Wagon* was really nothing more than a military adaptation of the portable hamburger and hot dog stands commonly experienced by the American public each summer at local fairs. Towed to forward locations, often in close proximity to the actual front lines, these mobile kitchens provided a variety of short order foods centering on fare such as hamburgers, hot dogs and french fries. A significant hit with the troops, *Wolfburger* stands proved an innovative and morale-boosting means of improving the quality and variety of the meals received by Army personnel in the theater.

The Army recognized the limitations of its troop feeding plans. Specifically, the operation highlighted the inability of the industrial base to respond effectively to increased demand on short notice. Under circumstances of more direct hostile action by opposing forces, reliance on more traditional prepackaged foods such as MREs is expected. However, the importance of good food to supporting the morale of troops exposed to extended periods of combat means that alternative rations should be a significant planning issue for future combat operations.

The Marine Corps feeding plan was similar to that of the Army in that it, too, called for one MRE and two hot meals daily. Within one week of arrival in theater, the Marine Corps was serving its first hot meal. Within a month, the majority of Marine Corps personnel were receiving two hot meals a day.

Rations for Air Force personnel were far more abundant and varied than those available to their Marine Corps and Army counterparts. Relying initially on rations included in

prepositioned storage sites, managers had these rations moved to operating locations in advance of the arrival of the forces. These rations, consisting primarily of MREs and B-rations, provided Air Force personnel with a sizable initial operating stock until other ration sources became available. Thus, Air Force units never faced any real possibility of a shortage of quality rations. The ready availability of prepositioned MREs, B-rations and Harvest Falcon kitchen equipment sets provided the Air Force with a substantial advantage in food service capability during the early phases of employment operations.

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When it came to the actual preparation of field rations by military food service personnel, the different Services experienced varying degrees of success with existing field kitchen equipment. The Army relied heavily on a mobile field cooking trailer that proved extremely fragile and worked well only in the most ideal of circumstances. The trailers offered only limited protection from the environment and sand was constantly finding its way, not only into the internal workings of the unit but, to the dismay of the troops, into the food being prepared. Food heaters were also ineffective or failed to work at all.

The Air Force's experience with its mobile field kitchens was somewhat better. Relying heavily on Harvest Falcon field kitchens, the Air Force's main problems stemmed from a shortage of readily available spare parts for the units. When equipment on the units failed in the field, replacement parts, readily available in the States, were difficult to obtain as they had to be procured through regular supply channels and then compete for transportation among the plethora of higher priority cargo moving to the theater. In this vein, the Marine Corps had a similar experience as field kitchen equipment failed at higher than anticipated rates due to the unaccustomed length of use and the degradation induced by the blowing sand and generally harsh climatic conditions in which the equipment was utilized.

The Air Force replenished B-rations from theater stocks on an as-requested basis. In addition, the relatively fixed locations at which the majority of Air Force personnel were billeted allowed Air Force food service management to rapidly transition the existing feeding capability to an almost cafeteria-style operation using host nation contractors. Such contractors provided fresh food on a daily basis, a wide selection of beverages and personnel for clean up and maintenance of dining facilities. In some instances, host nation personnel also provided food preparation and service. While generally allowing for the highest levels of food service and variety of fare available during the conflict, reliance on contracted personnel also led to unanticipated problems. At several bases, Air Force personnel were left with



Stocks of potable water have always been a critical factor for military operations and the Gulf War was no exception. In this photo bottled drinking water is moved from central storage to troops in the field. (Official Air Force Photo)

no way to prepare meals when contracted personnel left the installation after a warning of impending chemical attack was received. This situation was only alleviated when contractor personnel returned and were provided with appropriate protective equipment.

While there were shortages of certain types of rations during the initial phases of the deployment, one type of ration that was never in short supply was MREs. In fact, due to the relatively short duration of DESERT STORM, a surplus of MREs and B-rations developed. By April 1991, the Army's Material Management Center at Dhahran, the theater manager for food items, projected that a minimum of 16 million MREs were available in theater. The Air Force found itself with 50 to 70 40-foot shipping containers containing an estimated one million meals valued at \$4.5M. The Marine Corps likewise reported it had over 3.5 million MREs available in theater and another 2 million available aboard supply ships in the region.

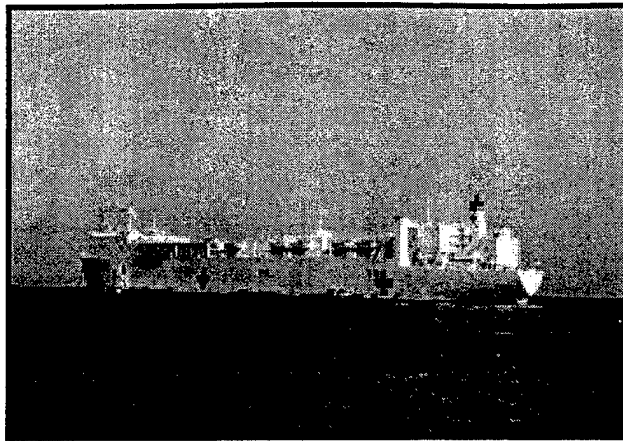
Given the abundance of MREs, Army Support Command actively encouraged soldiers rotating back to the US at the conclusion of hostilities to carry home at least a 3-day supply. This not only helped to eliminate the immediate stocks of forward deployed rations, but also minimized the need to feed large numbers of transiting Army personnel during sometimes lengthy delays at intermediate points on the route back to the United States. The remainder of food in country was designated for transfer to the World Bank for redistribution to needy countries. The majority of B-rations were used to feed Iraqi refugees during subsequent humanitarian assistance operations. The US Marines, ever resourceful and recognizing the Army's responsibility for overall management of food within the theater, simply transferred its stocks to the Army for disposition.

Water

Distributing water beyond central water points to individual units is a transportation intensive operation.

In addition to water intended for consumption, water to support laundering of hospital linens generated a considerable additional demand. For example, a 400-bed evacuation hospital requires 28,000 gallons of water per day.⁵

The US Army served as the chief water bearer for the four Services. That responsibility ultimately required the Army to



During the Gulf War the US deployed two naval hospital ships, the USS *Comfort* and the USS *Mercy*. The *Mercy* is seen in this photo. (Official Air Force Photo)



Medical personnel treat a troop overcome by heat exhaustion and dehydration. (Official Air Force Photo)

provide 20 gallons a day per soldier, sailor, airman and marine, as well as for on-site civilian advisors and contractors. The per-person daily allotment included six gallons for drinking, plus water for cooking, washing, hygiene and vehicle radiators.⁶

In addition to water obtained from approved host-nation supply sources, additional quantities were obtained through the use of reverse-osmosis water purification units capable of producing potable water from fresh, salt, brackish and chemically contaminated water supplies. Production capacities for these units ranged from 9,600 gallons per day for smaller units to 110,000 gallons per day from the largest. Local distribution was provided through an intricate network of water *buffaloes*, drums, bladders and miles of hose.⁷ Long-haul trucking of potable water was used where no local source of supply existed or could be developed. In many cases portable water purification units were used to minimize transportation requirements.

Medical Support

One of the most prevalent complaints encountered by deployed medical service personnel were various intestinal disorders associated with acclimatization to the food and environmental conditions in the theater.

Occasional incidents of heat exhaustion and dehydration were also encountered as well as several run-ins with venomous insects and snakes found throughout the region.⁸



A central mail facility handles the large volume of mail generated during the Gulf War. While mail proved to be a definite morale booster during the Gulf War, as it has in all previous wars or conflicts, it did require a substantial amount of airlift to move. (Official Air Force Photo)

Mail

The public outpouring of support for US forces was overwhelming. Schoolchildren, veteran's groups and ordinary citizens were writing letters and sending care packages, tapes and magazines that were shipped by military aircraft through the already congested APOEs. Postal authorities reported that more than 30 million pounds of mail were shipped from the beginning of DESERT SHIELD until Christmas. On 30 November alone, 617,000 pounds of mail was airlifted. As a result, assigning airlift priorities became a much more difficult task.

The defense depots routinely utilized express mail to ship thousands of small parcels to the theater. These parcels competed with standard mail and care packages for limited airlift to the theater. The Desert Express route resolved this conflict, but the logistics of moving hundreds of thousands of pounds of mail remained a major challenge. In order to alleviate the burden of distributing mail to the theater, on 19 January 1991, the Department of Defense requested that well-wishing troop supporters at home stop sending packages to deployed forces and limit mail to letters.⁹ By 5 February 1991, the postal service handled 273, 300 pounds of mail per day to Saudi Arabia. At an average of five pieces per pound, that was over 1.3 million items per day. That volume was down from the January high of an average 419,000 pounds per day. The sheer volume of mail

flowing to the Gulf region was not the only factor making mail distribution challenging. The situation was further complicated by the constant movement of troops and their units, which significantly increased the difficulty of forwarding the mail to the hundreds of Army, Air Force and Fleet post offices scattered throughout the theater.¹⁰

In addition to mail handled through formal postal channels, airline flight attendants and pilots began collecting magazines and books to bring over with each flight. Volunteer groups back in the US at units' home stations gathered books and magazines and collected board games and playing cards to be sent over with unit cargo whenever space would allow.¹¹

To maintain the morale of deployed troops, especially during the Christmas season, mail was first on the US Central Command's priority list. In one mid-December 1990 report, the cargo diversion team at Tinker AFB reported that over 50 percent of all aircraft departing were loaded with mail.¹²

Petroleum, Oil and Lubricants (POL)

The Gulf War was unique in military history as the first conflict in which any significant percentage of US tanks, ground vehicles, aircraft and ships were powered by the same type of fuel. While not universal, JP-8, a kerosene-based fuel, was used in a diverse range of vehicles. Included were the Army's M1A1 Abrams main battle tank, self-propelled howitzers and Bradley

Fighting Vehicles. The fuel was also used to power Army helicopters and at least one Navy ship with a gas-turbine engine plant. The majority of Air Force aircraft used JP-8 as well.¹³ The ability of systems to use a common fuel simplified the logistics of fuel distribution and more importantly provided commanders flexibility to obtain fuel from the most immediately available source. Since it was left to the individual commander's discretion as to which fuel to use, the decision largely rested on what fuel of which type was most readily available in the immediate area. The use of a single fuel, while not essential to the successful outcome of the Persian Gulf War, provided an opportunity to test a concept that could conceivably be vital to future US operations in more fuel-critical theaters.

Harvest Falcon

Initial Harvest Falcon deployments by the USAF included items to support housekeeping and mission-support operations: lighting sets, washers, dryers, shower and shaving units, portable latrines and electrical cable, for example. This equipment provided for immediate needs and aircraft support. Harvest Falcon assets were designed to support up to 750 aircraft and up to 55,000 personnel.¹⁴



Tent theaters were among the morale, welfare and recreation facilities established to support US personnel during the Gulf War. (Official Air Force Photo)

Morale, Welfare and Recreation

Once the immediate support needs of US forces were attended to, the Services took active steps to improve the quality of life of deployed personnel. The Air Force Commissary Service deployed over 100 personnel to distribute food and run tactical field exchanges.

Mini-exchanges offered a limited supply of toiletries, writing supplies and comfort items. They were stocked and operated by the Army and Air Force Exchange Service while manned by the commissary service as a part of its wartime mission.¹⁵

Shortages

It is important to note that as supplies moved to the Persian Gulf, depots also received new supplies from vendors and manufacturers at an almost equal rate. Shortages of some items such as MREs sometimes required depots to adopt innovative solutions through the use of similar alternative items. For example, Hormel's Top Shelf™ prepackaged meals were issued until MRE stocks could be replenished.¹⁶



Attack helicopters at a forward location are refueled. (Official Air Force Photo)

Some items could not be replenished as quickly as they were shipped. Modern sophisticated weapons such as laser-guided antitank missiles (like the Hellfire for US AH-64 Apache attack helicopters) and sophisticated antiaircraft missiles, are not produced in large quantities. Increasing production rates for rapid delivery is difficult because production lines are limited for major components like complex electronics. Other factors that made it difficult for vendors to rapidly increase production rates include limited numbers of skilled workers who assembled components; and the availability of special materials or limited resources.¹⁷

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The combined problems of limited initial stocks and low production rates meant that it was possible for US and allied forces to run out of certain items. If the Gulf War had lasted longer, it is unlikely that production could have met demand and permitted restoration of stocks.¹⁸

On 9 January 1991, President George Bush issued an executive order compelling civilian manufacturers to give first priority to the military. At the start of Operation DESERT SHIELD, some government planning experts believed the US possessed less than a ten-day supply of certain critical munitions stocks. The reasons given for such shortages included the Services' preference for high-tech weaponry over the last 20 years, a sharp reduction in orders during the year prior to Operation DESERT SHIELD due to the belief that the Cold War was over, and the fact that the commanders of forces in the Gulf were requesting more ammunition than Pentagon planners had anticipated.

Items in short supply included some varieties of tank and artillery shells, machine-gun rounds, rockets, mortars and other "dumb" munitions with high expenditure rates during combat. In an interview before Operation DESERT STORM, Army Major



Munitions storage and build-up (assembly) facilities were established in a number of locations during the Gulf War. (Official Air Force Photo)

General Paul Greenberg, commander of the Armament, Munitions and Chemical Command, the agency which buys munitions for all of the military Services, reported that shortages existed or were anticipated in numerous ammunition categories. The general went on to state that ammunition requisitions from Central Command forces were averaging about 125 percent of the planned consumption rates for a typical ground war.¹⁹

In the short run, Gulf force commanders were able to get around these shortages by turning to NATO allies for access to their stockpiles of munitions designed to be interchangeable with US weaponry. While NATO allies were generous in their willingness to provide such support, this was not a panacea. There were technical problems stemming from the environmental differences between Saudi Arabia and Western Europe, and in many cases, this was the first time US equipment was employed with allied ammunition.²⁰

By the end of November 1990, the Army had dipped into its European stockpiles for 1,000 Hellfire antiarmor missiles, 3,000 Tow II antiarmor missiles, 4,000 105mm artillery shells and 900,000 rounds of 25mm machine gun ammunition. During the first weeks of DESERT SHIELD, the Air Force requested and received, from Congress, an extra \$40M to order 600 additional GBU-27 laser guided bombs for immediate production.²¹

The reason for such shortages will no doubt be the subject of much controversy and debate for years to come. However, one aspect of the problem widely agreed upon is that the Services' preference for high-tech weaponry over so called *dumb* systems has promoted inventory shortages of the less sophisticated, but still vital weaponry. The ultimately successful employment of many high-technology weapons systems in the Gulf War is seen by many as vindicating the Services' desire for more expensive, higher technology systems. The fact that the US has never succeeded in building up a planned 60-day wartime operating stock of required ammunition should be a prime logistics concern inherent in the planning for any future military campaign. Clearly, a mix of both *smart* and *dumb* systems is required due to the wide range of target types and mission profiles encountered on the modern battlefield. The critical question for logisticians will be whether the *correct* balance of weapons types is available and whether the stockpiles of each are sufficient to support protracted combat operations as opposed to the limited combat phase encountered during Operation DESERT STORM.

Uniforms

An item that proved to be of significant concern to deploying troops and in short supply throughout DoD supply channels was the desert camouflage battle dress uniform (BDU). Many servicemen heading to the Middle East found that the desert BDU was unavailable through military supply channels and not stocked in military clothing sales stores. As such, many servicemen were forced to do their own shopping at military surplus stores for such items as the basic desert BDU ensemble, hats with wide brims appropriate for the desert environment and lightweight desert boots designed for the sandy environment of the Saudi Arabian peninsula. Service members really had little choice. They could either choose to buy the uniform themselves or go without. Given the high degree of uncertainty during the initial phases of DESERT SHIELD as to specific threats an individual was likely to encounter and which personnel were likely to become actively involved in a combat environment, a large number of personnel chose to use their own funds to purchase this *issue-item* that was otherwise unavailable through DoD supply channels.²²

Both the Army and the Marine Corps also had some difficulty with availability and sizing of uniforms, boots and, particularly, chemical defense ensembles. The Air Force experienced many of the same types of problems, but experienced the additional



Army troops wearing green battle dress uniforms (BDUs) board an aircraft for deployment to Southwest Asia. Supplies of the desert camouflage uniforms proved to be a problem during much of the Gulf War. (Official Air Force Photo)

limitation that desert camouflage uniforms were available to only approximately 20 percent of its personnel in theater.

Seen as a way around the long delays associated with massive requisition backlogs, units of all the Services found themselves in the business of *appropriating* or *liberating* needed materials to meet unit needs.

Scavenging War Supplies

To frontline officers, the most adept scavengers became vital to the getting needed supplies that were bogged down in a saturated logistics system. Scrounging and scavenging, as in so many wars before, evolved to a vital art during Operation DESERT SHIELD. Seen as a way around the long delays associated with massive requisition backlogs, units of all the Services found themselves in the business of *appropriating* or *liberating* needed materials to meet unit needs. Units were as apt to *borrow* what they needed from other units of their own Service as they were to commandeer materials from elements of the other Services. In addition to the outright covert raids carried out to obtain needed items, units became involved in an unofficial system of barter and exchange to meet their mission requirements. Thus, unit supply personnel might hold or obtain items needed by other units in order to gain an advantage during future negotiations. While the costs and benefits of this informal logistics system may be immeasurable, the existence of such a system has been an inseparable part of military campaigns throughout history.²³

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Observations

The fact that the US was able to successfully deploy the necessary forces and equipment to the Gulf should not be taken as an across-the-board proof that it could accomplish the same feat again for future conflicts. Operations DESERT SHIELD and DESERT STORM were unique in a number of respects. First, US forces had an unprecedented amount of time, 161 days, to set up the theater in preparation for combat operations. Setting up the requisite logistics infrastructure and positioning and posturing US forces in the face of active enemy resistance would have been considerably more difficult. Also, the existence of many modern

bases, ports and airfields throughout Saudi Arabia lessened the degree of preparation necessary. In fact, the Saudi Arabian ports utilized during DESERT SHIELD and DESERT STORM are some of the best in the world. The Saudis also provided fuel, water, ground transportation, as well as some housing and provisioning support.²⁴

DESERT STORM demonstrated that the United States is dangerously short of cargo ships and aircraft needed to get troops and their weaponry from the United States to distant trouble spots in a hurry. As Admiral Butcher stated,

It's dangerous to use DESERT SHIELD and DESERT STORM as a good example of what we can do in sealoft because 47 percent of it came from foreign ships, which might not be available in the next emergency.

Another advantage that the US could not count on in a future conflict, he said, is the use of Saudi Arabia of "the best seaports, the best airports." The foreign support, he stated, brought out not only the help of their cargo ships and planes, but permission to fly through their airspace.²⁵

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